

REMARKS

Claims 1, 3-5, 7, 8, 15, 17, 21, 23, 25, 26 and 29-32 are currently pending in this application. Claims 2 and 16 have been canceled. Applicants have carefully reviewed the Office Action and respectfully request reconsideration of the claims in view of the remarks presented below.

Claim Rejections Under 35 U.S.C. §103

Claims 1, 2, 4, 5, 15-17, 21, 23, 26, 31 and 32 were rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 4,712,555 (Thornander) in view of Warner et al., "Beat-by-Beat Modulation . . . " (Warner-Loeb).

Claims 2 and 16 have been canceled.

Regarding independent claims 1 and 15, Thornander was cited for disclosing delivering pacing pulses to an atrium, determining atrioventricular conduction interval but not determining respiratory cycle length based on atrioventricular conduction intervals. Warner-Loeb was cited for teaching that AV intervals show a 1-to-1 correlation to respiratory cycle length both with and without pacing. Based on this, the Office Action concluded that a change or trend in AV conduction interval times would be sufficient to determine a relative respiratory cycle length and therefore, it would have been obvious to modify the system of Thornander to determine respiratory cycle length based on a comparison of AVIs as taught in Warner-Loeb.

As an initial point, claims 1 and 15 do not recite determining respiratory cycle length based on atrioventricular conduction intervals. They instead, recite comparing AV intervals over a period of time to detect an interval pattern indicative of either normal respiration or abnormal respiration. Accordingly, the rejection of claims 1 and 15 in view of Thornander and Warner-Loeb, as set forth in the Office Action is without merit as it fails to address the proper claimed subject matter.

That said, Thornander discloses a pacemaker that adjusts its pacing rate in response to cardiac interval measurements. Thornander theorizes that changes in a

person's physiological needs, e.g. a need for an increase in oxygenated blood flow, produce corresponding changes in cardiac intervals. See column 1, lines 56-57 and column 9, lines 1-18. Accordingly, in order to comply with physiological needs, cardiac intervals are measured and compared to a reference interval measurement to determine if the interval is increasing or decreasing, and the pacing rate is increased or decreased in order to meet those needs. See FIG. 12A. The interval measurements in Thornander are not compared with each other in anyway to detect an interval pattern indicative of either normal respiration or abnormal respiration, as recited in independent claims 1 and 15.

Warner-Loeb describes varying correspondences between AV intervals and respiratory cycles in the presence of atrial pacing. Warner-Loeb, however, like Thornander do not teach or suggest detecting an AV interval pattern indicative of either normal respiration or abnormal respiration, as recited in independent claims 1 and 15.

Regarding independent claims 21 and 23, the Office Action only mentions Thornander in its reason for rejection. Therefore, it is unclear whether these claims are considered to be anticipated by Thornander or obvious in view of Thornander and Warner-Loeb.

Regardless of the basis for the rejection of claims 21 and 23, it is noted that both of these claims recite structure that compares atrioventricular intervals to detect an interval pattern indicative of either normal respiration or abnormal respiration – not structure that determines respiratory cycle length based on atrioventricular conduction intervals. As with respect to claims 1 and 15, the Office Action again does not address the proper subject matter of claims 21 and 23. Furthermore, neither Thornander nor Warner-Loeb teach or suggest comparing AV intervals to detect an interval pattern indicative of either normal respiration or abnormal respiration. As such, neither Thornander nor Warner-Loeb, can reasonably be considered to disclosure structure that compares atrioventricular intervals to detect an interval pattern indicative of either normal respiration or abnormal respiration, as recited in claim 21 and 23.

In view of the foregoing, Applicants submit that claims 1, 15, 21 and 23 are patentable over the combination of Thornander and Warner-Loeb. Accordingly, Applicants request reconsideration of the §103 rejections of these claims and their respective dependent claims 4, 5, 17, 26, 31 and 32.

Regarding claims 31 and 32, the Office Action states that AV intervals are based on heart rate, which is an inherently cyclical pattern. Claims 31 and 32, however, relate to AV interval patterns – not just AV intervals. Warner-Loeb state that “oscillations [i.e., patterns] in AV interval are not the result of concurrent variations in [cardiac] cycle length [i.e., heart rate].” See page 1128, column 1. Therefore, AV interval patterns are not inherently based on heart rate patterns. Furthermore, AV interval patterns are not inherently cyclical either. See Warner-Loeb, figure 4 and Applicants’ figure 8, bottom graph.

Claim 3 was rejected under 35 U.S.C. §103 as being unpatentable over Thornander in view of Warner-Loeb and further in view of Applicant’s admitted prior art (Admission). Claims 29 and 30 were rejected under 35 U.S.C. §103 as being unpatentable over Thornander in view of Warner-Loeb and further in view of U.S. Patent Publication 2005/0119711 (Cho `711).

In view of the arguments presented above regarding the rejection of independent claim 1 over Thornander and Warner-Loeb, Applicants believe that the rejections of claim 3, 29 and 30 under §103 are moot as these dependent claims depend from allowable independent base claim 1. Furthermore, regarding Cho `711 and its relevance to claims 29 and 30, it is noted that Cho `711 teaches that cyclic oscillation in heart rate may be an indicator of a breathing disorder. Cho `711 does not teach or suggest that AV interval patterns may be an indication of normal or abnormal respiration. In fact, Warner-Loeb state that “oscillations in AV interval are not the result of concurrent variations in [cardiac] cycle length.” See page 1128, column 1. Thus, suggesting that an AV interval pattern analysis, as included in claims 29 and 30, would not yield results corresponding with the heart rate pattern analysis described in Cho `711.

Claims 15, 16, 21, 23 and 26 were rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 5,919,210 (Lurie) in view of Warner-Loeb.

Claim 16 has been canceled.

Regarding claims 15, 21 and 23, again the Office Action addresses only respiratory cycle length – not the claimed subject matter, i.e., the comparison of avtrioventricular intervals to detect interval patterns indicative of either normal respiration or abnormal respiration.

That said, Lurie discloses a devise that detects syncope based on sensing of physiologic activity. Exemplary physiological activities include AV conduction times and respiration rate. The only methods or devices disclosed in Lurie for determining respiration rate involve chest wall impedance. See column 2, lines 23-24. Thus, Lurie does not disclose comparing AV intervals to detect an interval pattern indicative of either normal respiration or abnormal respiration, as recited in claim 15, or structure for implementing such comparison, as recited in claims 21 and 23.

Warner-Loeb described varying correspondences between AV intervals and respiratory cycles in the presence of atrial pacing. Warner-Loeb, however, like Lurie does not teach or suggest comparing AV intervals to detect an interval pattern indicative of either normal respiration or abnormal respiration, as recited in claim 15, or structure for implementing such comparison, as recited in claims 21 and 23.

In view of the foregoing, Applicants submit that claims 15, 21 and 23 are patentable over the combination of Lurie and Warner-Loeb. Accordingly, Applicants request reconsideration of the §103 rejections of claims 15, 21 and 23 and dependent claim 26.

Allowable Subject Matter

Claims 7, 8 and 25 were allowed.

CONCLUSION

Applicants have made an earnest and bona fide effort to clarify the issues before the Examiner and to place this case in condition for allowance. Therefore, allowance of Applicants' claims 1, 3-5, 7, 8, 15, 17, 21, 23, 25, 26 and 29-32 is believed to be in order.

Respectfully submitted,

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Date

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